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THANGAVELU, KANDASAMY	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/894,870	BUTLER ET AL.
	Examiner	Art Unit
	Kandasamy Thangavelu	2123

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 June 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-58* is/are pending in the application.

4a) Of the above claim(s) *22-58* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-58* are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 June 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Election/Restriction

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-8 drawn to a method for producing **optimum design specifications** for omni-directional, broadband antennas, involving selecting an algorithmic process for optimum configuration specification, classified in class 703, subclass 2.

II. Claims 9-21 drawn to a method for **designing and producing basic antenna and a sleeve antenna**, involving selecting antenna designs based on optimum fitness value using genetic algorithm, classified in class 703, subclass 2.

III. Claims 22-28, drawn to design of **antenna for broadband, omni-directional communications**, involving design using performance ranking, classified in class 703, subclass 2.

IV. Claims 29-40 drawn to design of **broadband cage antennas**, involving cage geometry algorithm and fitness ranking, classified in class 703, subclass 2.

V. Claims 41-43 drawn to a method of **determining electronic current** in omni-directional antennas, involving system of impedance equations, classified in class 343, subclass 700.

VI. Claims 44-49 drawn to an **omni-directional sleeve antenna**, classified in class 343, subclass 700.

VII. Claims 50-58 drawn to a **sleeve cage antenna**, classified in class 343, subclass 700.

1.1 Inventions Groups I and II-V are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because the combination involves selecting an algorithmic process for optimum configuration specification; there are numerous algorithm processes available for optimum configuration specification.

The subcombinations have separate utilities such as follows:

In the instant case, the invention of Group II has separate utility such as selecting antenna designs based on optimum fitness value using genetic algorithm. The invention of Group III has separate utility such as design of antenna for broadband, omni-directional communications, involving design using performance ranking. The invention of Group IV has separate utility such as design of broadband cage antennas, involving cage geometry algorithm and fitness ranking. The invention of Group V has separate utility such as determining electronic current in omni-directional antennas.

These separate uses distinguish the invention of each of Groups II, III, IV and V from one another. Therefore, the invention of each of Groups II, III, IV and V is a separately useable subcombination. See MPEP § 806.05(d).

1.2 Inventions Groups I-V and VI-VII are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product as claimed can be made by another and materially different process. Group VI omni-directional sleeve antenna can be made using not only the genetic algorithm but also other optimization algorithms such as simulated annealing, neural networks etc. Group VII cage antenna can be made using not only the fitness ranking but also using other optimization algorithms such as simulated annealing, neural networks, full search etc.

1.3 Groups I and II are related and can be treated as one supergroup I and dealt with simultaneously. Groups III, IV and V are related and can be treated as supergroup II and handled at the same time. Groups VI and VII deal with the product made, can be treated as supergroup III and should be handled by someone in the Electronic and telecommunication classes.

1.4 Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification and/or recognized divergent subject matter, restriction for examination purposes as indicated is proper.

1.5 During a telephone conversation with Applicants' attorney, Mr. Richard Moose, Reg. No. 31,226 on 22 November, 2004 a provisional election was made without traverse to prosecute the invention of supergroup I, claims 1-21. Affirmation of this election must be made by applicant in replying to this Office action. Claims 22-58 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

2. Claims 1-21 have been examined.

Domestic Priority

3. Acknowledgment is made of the applicants' request for domestic priority based on the provisional application 60/215,434 filed on June 30, 2000. The applicants' request for domestic priority under 35 U.S.C. 119 (e) is granted.

Information Disclosure Statement

4. Acknowledgment is made of the information disclosure statements filed on August 26, 2002 with a list of papers. The papers have been considered in reviewing the claims.

Drawings

5. The drawings are objected to as follows:

Figures shall be consecutively numbered in the order in which they are first used in the specification, starting with Figure 1. Using Figure numbers 101-104, 201-203 and then 301-304 is misleading. What happened to the missing figure numbers and figures? Duplicate figures shall be removed.

Figures 1 to 26 are referenced after Figures 301- 304. They shall be renumbered to follow the order of their reference in the specification.

Inclusion of the figures in the specification from Page 129 to Page 185 is against the recommended organization of the specification. All those figures shall be removed and included in the Drawings section, eliminating the duplication. Drawings section is separate from the specification. Only those figures that are described in the written specification shall be included and not all figures from any technical presentations that the inventors might have made on the subject.

Each figure shall be assigned a figure number and listed in the Drawings section of the specification.

In view of the above objections to the drawings, the applicants are directed to furnish new set of drawings.

Specification

6. The disclosure is objected to because of the following informalities:

6.1 The specification and the claims have been prepared partly in single line spacing and partly in double line spacing. The spacing of the lines of the specification is such as to make reading and entry of amendments difficult.

6.2 The specification shall include line numbers, so reference can be made to the specification using page and line numbers. Then if errors are detected in the specification, they can then be identified easily using Page and Line numbers.

6.3 The specification includes a paper prepared for publication using the paper format, as part of the specification, disregarding the specification format specified in MPEP. The applicants are directed to remove the paper from the specification and incorporate its contents in the specification using the recommended Specification format. The applicants' attention is directed to the following requirement for the specification:

6.3.1 The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant's use.

Arrangement of the Specification

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

(a) TITLE OF THE INVENTION.
(b) CROSS-REFERENCE TO RELATED APPLICATIONS.
(c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.
(d) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC (See 37 CFR 1.52(e)(5) and MPEP 608.05. Computer program listings (37 CFR 1.96(c)), "Sequence Listings" (37 CFR 1.821(c)), and tables having more than 50 pages of text are permitted to be submitted on compact discs.) or
REFERENCE TO A "MICROFICHE APPENDIX" (See MPEP § 608.05(a). "Microfiche Appendices" were accepted by the Office until March 1, 2001.)
(e) BACKGROUND OF THE INVENTION.
(1) Field of the Invention.
(2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
(f) BRIEF SUMMARY OF THE INVENTION.
(g) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
(h) DETAILED DESCRIPTION OF THE INVENTION.
(i) CLAIM OR CLAIMS (commencing on a separate sheet).
(j) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
(k) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required "Sequence Listing" is not submitted as an electronic document on compact disc).

6.3.2 Content of Specification

(a) Title of the Invention: See 37 CFR 1.72(a) and MPEP § 606. The title of the invention should be placed at the top of the first page of the specification unless the title is provided in an application data sheet. The title of the invention should be brief but technically accurate and descriptive, preferably from two to seven words may not contain more than 500 characters.

(b) Cross-References to Related Applications: See 37 CFR 1.78 and MPEP § 201.11.

(c) Statement Regarding Federally Sponsored Research and Development: See MPEP § 310.

(d) Incorporation-By-Reference Of Material Submitted On a Compact Disc: The specification is required to include an incorporation-by-reference of electronic documents that are to become part of the permanent United States Patent and Trademark Office records in the file of a patent application. See 37 CFR 1.52(e) and MPEP § 608.05. Computer program listings (37 CFR 1.96(c)), "Sequence Listings" (37 CFR 1.821(c)), and tables having more than 50 pages of text were permitted as electronic documents on compact discs beginning on September 8, 2000.

Or alternatively, Reference to a "Microfiche Appendix": See MPEP § 608.05(a). "Microfiche Appendices" were accepted by the Office until March 1, 2001.

(e) Background of the Invention: See MPEP § 608.01(c). The specification should set forth the Background of the Invention in two parts:

(1) Field of the Invention: A statement of the field of art to which the invention pertains. This statement may include a paraphrasing of the applicable U.S. patent classification definitions of the subject matter of the claimed invention. This item may also be titled "Technical Field."

(2) Description of the Related Art including information disclosed under 37 CFR 1.97 and 37 CFR 1.98: A description of the related art known to the applicant and including, if applicable, references to specific related art and problems involved in the prior art which are solved by the applicant's invention. This item may also be titled "Background Art."

(f) Brief Summary of the Invention: See MPEP § 608.01(d). A brief summary or general statement of the invention as set forth in 37 CFR 1.73. The summary is separate and distinct from the abstract and is directed toward the invention rather than the disclosure as a whole. The summary may point out the advantages of the invention or how it solves problems previously existent in the prior art (and preferably indicated in the Background of the Invention). In chemical cases it should point out in general terms the utility of the invention. If possible, the nature and gist of the invention or the inventive concept should be set forth. Objects of the invention should be treated briefly and only to the extent that they contribute to an understanding of the invention.

(g) Brief Description of the Several Views of the Drawing(s): See MPEP § 608.01(f). A reference to and brief description of the drawing(s) as set forth in 37 CFR 1.74.

(h) Detailed Description of the Invention: See MPEP § 608.01(g). A description of the preferred embodiment(s) of the invention as required in 37 CFR 1.71. The description should be as short and specific as is necessary to describe the invention adequately and accurately. Where elements or groups of elements, compounds, and processes, which are conventional and generally widely known in the field of the invention described and their exact nature or type is not necessary for an understanding and use of the invention by a person skilled in the art, they should not be described in detail. However, where particularly complicated subject matter is involved or where the elements, compounds, or processes may not be commonly or widely known in the field, the specification should refer to another patent or readily available publication which adequately describes the subject matter.

(i) Claim or Claims: See 37 CFR 1.75 and MPEP § 608.01(m). The claim or claims must commence on separate sheet or electronic page (37 CFR 1.52(b)(3)). Where a claim sets forth a plurality of elements or steps, each element or step of the claim should be separated by a line indentation. There may be plural indentations to further segregate subcombinations or related steps. See 37 CFR 1.75 and MPEP § 608.01(i)-(p).

(j) Abstract of the Disclosure: See MPEP § 608.01(f). A brief narrative of the disclosure as a whole in a single paragraph of 150 words or less commencing on a separate sheet following the claims. In an international application which has entered the national stage (37 CFR 1.491(b)), the applicant need not submit an abstract commencing on a separate sheet if an abstract was published with the international application under PCT Article 21. The abstract that appears on the cover page of the pamphlet published by the International Bureau (IB) of the World Intellectual Property Organization (WIPO) is the abstract that will be used by the USPTO. See MPEP § 1893.03(e).

(k) Sequence Listing. See 37 CFR 1.821-1.825 and MPEP §§ 2421-2431. The requirement for a sequence listing applies to all sequences disclosed in a given application, whether the sequences are claimed or not. See MPEP § 2421.02.

6.4. The description portion of this application contains a **computer program listing** consisting of more than ten (10) pages. In accordance with 37 CFR 1.96(c), a computer program listing printout of more than ten pages must be submitted as a "CD ROM" conforming to the standards set forth in 37 CFR 1.96(c)(2) and must be appropriately

referenced in the specification (see 37 CFR 1.77(a)(6)). Accordingly, applicant is required to cancel the computer program listing appearing in the specification on pages 17-31, file a "CD ROM" in compliance with 37 CFR 1.96(c) and insert an appropriate reference to the newly added "CD ROM" at the beginning of the specification.

Substitute specification required

7.0 A substitute specification excluding the claims is required pursuant to 37 CFR 1.125(a) because of the reasons presented in Paragraphs 5 and 6 above, for any further Office Action on this application.

A substitute specification must not contain new matter. The substitute specification must be submitted with markings showing all the changes relative to the immediate prior version of the specification of record. The text of any added subject matter must be shown by underlining the added text. The text of any deleted matter must be shown by strike-through except that double brackets placed before and after the deleted characters may be used to show deletion of five or fewer consecutive characters. The text of any deleted subject matter must be shown by being placed within double brackets if strike-through cannot be easily perceived. An accompanying clean version (without markings) and a statement that the substitute specification contains no new matter must also be supplied. Numbering the paragraphs of the specification of record is not considered a change that must be shown.

Abstract

8. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

The abstract shall be prepared in double spacing to make easy reading and entry of amendments possible.

Claim Rejections - 35 USC § 112

9. The following is a quotation of the first paragraph of 35 U.S.C. §112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

10. Claims 1-21 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

10.1 Claim 1 states, "A method for producing optimum design specifications for omni-directional, broadband antennas, comprising the following steps:

providing design criteria for a basic antenna configuration as input to an algorithmic process;

... and

identifying selected of said improved antenna configurations as optimum configurations based on a predetermined combination of selected antenna performance characteristics".

The specification does not specify anywhere what is meant by "design specification" and what are the optimum design specifications. The specification does not specify how the optimum design specifications are arrived at from optimum configurations of the antenna.

The specification does not describe anywhere the term "design criteria". The basic antenna configurations will have design parameters, but what are the design criteria associated

with the basic antenna configuration? The Webster's dictionary states that criterion means a standard on which a judgment is made.

The specification does not specify what is meant by "basic antenna configuration". It only talks about monopole, dipole, helical and cage antennas and the various antennas with sleeves.

The specifications describes as performance characteristics Voltage standing wave ratio, input impedance, electric current through the antenna and directivity. The specification does not describe how a combination of selected performance characteristics is used to select the optimum antenna configurations. It uses a fitness value for selecting the antenna configuration; the fitness value is based on the frequency ratio between the largest and smallest frequencies of the broadband (Specification, Page 2, Para 5).

10.2 Claim 2 states, "said design criteria includes at least one of an ideal frequency range of operation and dimensions of wires or of other elements for use in constructing said antenna configurations".

The frequency range of operation is a performance characteristic and is a function of design parameters. The dimensions of wires or of other elements for use in constructing said antenna configurations are design parameters. Does it mean that the design criteria comprise the performance characteristics and design parameters? The specification does not describe anywhere what the design criteria are.

10.3 Claim 5 states, "said selected antenna performance characteristics include at least one of input impedance, electric current through said antenna configuration, directivity, and reflection coefficient magnitude".

The specifications describes as performance characteristics Voltage standing wave ratio, input impedance, electric current through the antenna and directivity. The specification does not describe reflection coefficient magnitude anywhere. It does not describe how a combination of selected performance characteristics is used to select the optimum antenna configurations. It uses a fitness value for selecting the antenna configuration; the fitness value is based on the frequency ratio between the largest and smallest frequencies of the broadband (Specification, Page 2, Para 5).

10.4 Claim 6 states, "A sleeve monopole antenna as produced by the optimum design specification method of claim 1".

The specification describes only cage and helix monopole antennas and their sleeve versions. It does not describe the generic monopole antenna, the sleeve version of the generic monopole antenna and how the sleeve version is made from the generic monopole antenna. It also does not specify how the sleeve monopole antenna is produced from the optimum design specifications.

10.5 Claim 8 states, "A sleeve dipole antenna as produced by the optimum design specification method of claim 1".

The specification describes only cage and helix monopole antennas and their sleeve versions. It does not describe the generic dipole antenna, the sleeve version of the generic dipole antenna and how the sleeve version is made from the generic dipole antenna. It also does not specify how the sleeve dipole antenna is produced from the optimum design specifications.

10.6 Claim 9 states, "A method for designing and producing a sleeve antenna structure characterized by omni-directional capabilities over a generally wide frequency range, comprising:

defining initial antenna parameters and providing a corresponding range of potential values for selected of said initial antenna parameters;

... such that selected individual antenna designs of said population of individual antenna designs are assigned a fitness value that characterizes selected performance measures of said individual antenna design;

...

executing at least a second iteration of said algorithmic process to generate an additional population of individual antenna designs with a corresponding fitness value assigned to selected individual antenna designs of said additional population".

The specification describes the parameters used for the cage antennas and helical antennas. However, it does not describe the generic monopole and dipole antennas and the parameters used for the antennas.

The specifications describes as performance characteristics Voltage standing wave ratio, input impedance, electric current through the antenna and directivity. The specification does not describe how the selected performance measures are used to assign a fitness value for the individual antenna design. It only uses the fitness value that is based on the frequency ratio between the largest and smallest frequencies of the broadband (Specification, Page 2, Para 5).

10.7 Claim 12 states, "said selected performance measures include at least one of a voltage standing wave ratio, input impedance, directivity, and reflection coefficient magnitude of selected of said individual antenna designs".

The specifications describes as performance characteristics Voltage standing wave ratio, input impedance, electric current through the antenna and directivity. The specification does not describe reflection coefficient magnitude anywhere. The specification does not describe how the selected performance measures are used to assign a fitness value for the individual antenna design. It only uses the fitness value that is based on the frequency ratio between the largest and smallest frequencies of the broadband (Specification, Page 2, Para 5).

10.8 Claim 13 states, "A sleeve antenna as produced by the design method of claim 9, wherein said sleeve antenna comprises one of a sleeve monopole antenna and a sleeve dipole antenna".

The specification describes only cage and helix monopole antennas and their sleeve versions. It does not describe the generic monopole antenna, the sleeve version of the generic

monopole antenna and how the sleeve version is made from the generic monopole antenna. It does not describe the generic dipole antenna, the sleeve version of the generic dipole antenna and how the sleeve version is made from the generic dipole antenna.

10.9 Claim 15 states, "A process for enhancing basic antenna configurations to accommodate ideal operation in a wider frequency band, comprising the steps of:

providing a design algorithm for use in accordance with said process for enhancing basic antenna configurations as input to said design algorithm;

providing general antenna parameters and a corresponding range of potential values for selected of said general antenna parameters;

… wherein each individual antenna of said population of individual antenna designs is assigned a fitness value that characterizes selected performance measures of said individual antenna design …".

The specification does not specify what is meant by "basic antenna configuration". It only talks about monopole, dipole, helical and cage antennas and the various antennas with sleeves. The specification does not describe what is meant by "ideal operation".

The specification does not describe anywhere the process of enhancing basic antenna configuration as input to the design algorithm.

The specification describes the parameters used for the cage antennas and helical antennas. However, it does not describe the generic monopole and dipole antennas and the parameters used for the antennas.

The specifications describes as performance characteristics Voltage standing wave ratio, input impedance, electric current through the antenna and directivity. The specification does not describe how the selected performance measures are used to assign a fitness value for the individual antenna design. It only uses the fitness value that is based on the frequency ratio between the largest and smallest frequencies of the broadband (Specification, Page 2, Para 5).

10.10 Claim 18 states, "said fitness value relates to a bandwidth ratio of highest frequency to lowest frequency within a selected frequency range of operation for which certain performance criteria are met".

The specification relates the fitness value to the frequency ratio when certain values of VSWR are achieved. Therefore, the only performance criterion used is VSWR. The specification does not relate the fitness value to the frequency ration for any other performance criteria such as input impedance, electric current through the antenna configuration, directivity and reflection coefficient.

Claims rejected but not specifically addressed are rejected based on their dependency on rejected claims.

11. Claims 1-21 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the

art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

11.1 Claim 1 states, ""A method for producing optimum design specifications for omni-directional, broadband antennas, comprising the following steps:

providing design criteria for a basic antenna configuration as input to an algorithmic process;

. . . and

identifying selected of said improved antenna configurations as optimum configurations based on a predetermined combination of selected antenna performance characteristics".

The specification does not specify anywhere what is meant by "design specification" and what are the optimum design specifications. The specification does not specify how the optimum design specifications are arrived at from optimum configurations of the antenna.

The specifications describes as performance characteristics Voltage standing wave ratio, input impedance, electric current through the antenna and directivity. The specification does not describe how a combination of selected performance characteristics is used to select the optimum antenna configurations. It uses a fitness value for selecting the antenna configuration; the fitness value is based on the frequency ratio between the largest and smallest frequencies of the broadband (Specification, Page 2, Para 5).

11.2 Claim 9 states, "A method for designing and producing a sleeve antenna structure characterized by omni-directional capabilities over a generally wide frequency range, comprising:

defining initial antenna parameters and providing a corresponding range of potential values for selected of said initial antenna parameters;

... such that selected individual antenna designs of said population of individual antenna designs are assigned a fitness value that characterizes selected performance measures of said individual antenna design;

...

executing at least a second iteration of said algorithmic process to generate an additional population of individual antenna designs with a corresponding fitness value assigned to selected individual antenna designs of said additional population".

The specification describes the parameters used for the cage antennas and helical antennas. However, it does not describe the generic monopole and dipole antennas and the parameters used for the antennas.

The specifications describes as performance characteristics Voltage standing wave ratio, input impedance, electric current through the antenna and directivity. The specification does not describe how the selected performance measures are used to assign a fitness value for the individual antenna design. It only uses the fitness value that is based on the frequency ratio between the largest and smallest frequencies of the broadband (Specification, Page 2, Para 5).

11.3 Claim 15 states, "A process for enhancing basic antenna configurations to accommodate ideal operation in a wider frequency band, comprising the steps of:

providing a design algorithm for use in accordance with said process for enhancing basic antenna configurations as input to said design algorithm;

providing general antenna parameters and a corresponding range of potential values for selected of said general antenna parameters;

... wherein each individual antenna of said population of individual antenna designs is assigned a fitness value that characterizes selected performance measures of said individual antenna design ...".

The specification does not describe what is meant by "ideal operation" in a wider frequency band.

The specification does not describe anywhere the process of enhancing basic antenna configuration as input to the design algorithm.

The specification describes the parameters used for the cage antennas and helical antennas. However, it does not describe the generic monopole and dipole antennas and the parameters used for the antennas.

The specifications describes as performance characteristics Voltage standing wave ratio, input impedance, electric current through the antenna and directivity. The specification does not describe how the selected performance measures are used to assign a fitness value for the individual antenna design. It only uses the fitness value that is based on the frequency ratio between the largest and smallest frequencies of the broadband (Specification, Page 2, Para 5).

Claims rejected but not specifically addressed are rejected based on their dependency on rejected claims.

12. The following is a quotation of the second paragraph of 35 U.S.C. § 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

13. Claims 1-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

13.1 Claim 1 states, "A method for producing optimum design specifications for omni-directional, broadband antennas, comprising the following steps:

providing design criteria for a basic antenna configuration as input to an algorithmic process;

... and

identifying selected of said improved antenna configurations as optimum configurations based on a predetermined combination of selected antenna performance characteristics".

The specification does not specify anywhere what is meant by "design specification" and what are the optimum design specifications. Therefore the terms "design specification" and "optimum design specification" are vague and indefinite.

The specification does not describe anywhere the term "design criteria". The basic antenna configurations will have design parameters, but what are the design criteria associated with the basic antenna configuration? The Webster's dictionary states that criterion means a standard on which a judgment is made. Therefore the term "design criteria" is vague and indefinite.

The specification does not specify what is meant by "basic antenna configuration". It only talks about monopole, dipole, helical and cage antennas and the various antennas with sleeves. The term "basic antenna configuration" is vague and indefinite.

13.2 Claim 3 recites the limitation "wherein selected of said improved antenna configurations comprise combinations of at least two of said basic antenna configurations". There is insufficient antecedent basis for "at least two of said basic antenna configurations" in this limitation, as claim 1 deals with only a basic antenna configuration

13.3 Claim 9 states, "A method for designing and producing a sleeve antenna structure characterized by omni-directional capabilities over a generally wide frequency range, comprising:

defining initial antenna parameters and providing a corresponding range of potential values for selected of said initial antenna parameters;

... such that selected individual antenna designs of said population of individual antenna designs are assigned a fitness value that characterizes selected performance measures of said individual antenna design;

. . .

executing at least a second iteration of said algorithmic process to generate an additional population of individual antenna designs with a corresponding fitness value assigned to selected individual antenna designs of said additional population".

The specification describes the parameters used for the cage antennas and helical antennas. However, it does not describe the generic monopole and dipole antennas and the parameters used for the antennas. Therefore, the term "initial antenna parameters" is vague and indefinite for the generic monopole and dipole antennas.

The specifications describes as performance characteristics Voltage standing wave ratio, input impedance, electric current through the antenna and directivity. The specification does not describe how the selected performance measures are used to assign a fitness value for the individual antenna design. It only uses the fitness value that is based on the frequency ratio between the largest and smallest frequencies of the broadband (Specification, Page 2, Para 5). Therefore, the term "a fitness value that characterizes selected performance measures" is vague and indefinite.

13.4 Claim 15 states, "A process for enhancing basic antenna configurations to accommodate ideal operation in a wider frequency band, comprising the steps of:

providing a design algorithm for use in accordance with said process for enhancing basic antenna configurations as input to said design algorithm;

providing general antenna parameters and a corresponding range of potential values for selected of said general antenna parameters;

... wherein each individual antenna of said population of individual antenna designs is assigned a fitness value that characterizes selected performance measures of said individual antenna design ...".

The specification does not specify what is meant by "basic antenna configurations". It only talks about monopole, dipole, helical and cage antennas and the various antennas with sleeves. The term "basic antenna configurations" is vague and indefinite.

The specification does not describe what is meant by "ideal operation" in a wider frequency band. Therefore this term is vague and indefinite.

The limitation, "providing a design algorithm for use in accordance with said process for enhancing basic antenna configurations as input to said design algorithm" is vague and indefinite.

The specification describes the parameters used for the cage antennas and helical antennas. However, it does not describe the generic monopole and dipole antennas and the parameters used for the antennas. Therefore, the term "general antenna parameters" is vague and indefinite for the generic monopole and dipole antennas.

The specifications describes as performance characteristics Voltage standing wave ratio, input impedance, electric current through the antenna and directivity. The specification does not describe how the selected performance measures are used to assign a fitness value for the

individual antenna design. It only uses the fitness value that is based on the frequency ratio between the largest and smallest frequencies of the broadband (Specification, Page 2, Para 5). Therefore, the term "a fitness value that characterizes selected performance measures" is vague and indefinite.

Claims rejected but not specifically addressed are rejected based on their dependency on rejected claims.

14. Claims 1-8 are rejected under 35 U.S.C. § 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are:

14.1 Claim 1 states, "A method for producing optimum design specifications for omni-directional, broadband antennas, comprising the following steps:

providing design criteria for a basic antenna configuration as input to an algorithmic process;

... and

identifying selected of said improved antenna configurations as optimum configurations based on a predetermined combination of selected antenna performance characteristics".

The method specifies how the optimum antenna configurations are arrived at starting with a basic antenna configuration. However, it does not include the additional steps of using the

data from the optimum antenna configurations to produce the optimum design specifications. It is not clear what the applicants meant by optimum design specifications and how they are arrived at from optimum configurations of the antenna.

Claims rejected but not specifically addressed are rejected based on their dependency on rejected claims.

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

16. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

17. Claims 1-6 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Altman et al.** ("New designs of ultra wideband communication antennas using Genetic algorithm", IEEE 1997) in view of **de Schweinitz et al.** (U.S. Patent 6,317,092).

17.1 **Altman et al.** teaches New designs of ultra wideband communication antennas using Genetic algorithm. Specifically, as per claim 1, **Altman et al.** teaches a method for producing optimum design specifications for omni-directional, broadband antennas (Page 1494, CL1, Para 3, L1-3; Page 1494, CL2, Para 2, L1-4; Page 1494, CL2, Para 3, L1-6; Page 1494, CL1, Para 3, L5-10; Page 1495, CL2, Para 3, L1-5); comprising the following steps:

providing design criteria for a basic antenna configuration as input to an algorithmic process (Page 1494, CL2, Para 2, L1-7; Page 1494, CL2, Para 3, L1-8; Page 1497, CL1, Para 5, L6-10); and

identifying selected of the improved antenna configurations as optimum configurations based on a predetermined combination of selected antenna performance characteristics (Page 1494, CL2, Para 2, L1-7; Page 1494, CL2, Para 3, L1-8).

Altman et al. teaches executing the algorithmic process to determine position of loads, the load values and the parameters of the matching network for combination with the basic antenna configuration to create improved antenna configurations (Page 1494, CL2, Para 3, L1-8). **Altman et al.** does not expressly teach executing the algorithmic process to determine size and position of parasitic elements for combination with the basic antenna configuration to create improved antenna configurations. **de Schweinitz et al.** teaches determining size and position of

parasitic elements for combination with the basic antenna configuration to create improved antenna configurations (Fig. 1; Abstract, L1-3; CL1, L52-54; CL1, L57-59; CL2, L56-67; CL3, L61-67), because the parasitic elements form a lens which provides directionality of the antenna (Abstract, L14-16); and allows synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage (CL2, L35-38). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to combine the algorithmic process to determine the parameters for the basic antenna configuration to create improved antenna configurations method of **Altman et al.** with the method of **de Schweinitz et al.** that included determining size and position of parasitic elements for combination with the basic antenna configuration to create improved antenna configurations. The artisan would have been motivated because the parasitic elements would form a lens which would provide directionality of the antenna; and allow synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage.

17.2 As per claim 2, **Altman et al.** and **de Schweinitz et al.** teach the method of claim 1. **Altman et al.** teaches that the design criteria includes at least one of an ideal frequency range of operation and dimensions of wires or of other elements for use in constructing the antenna configurations (Page 1494, CL2, Para 2, L1-7; Fig 2; Page 1494, CL2, Para 3, L3-6).

17.3 As per claim 3, **Altman et al.** and **de Schweinitz et al.** teach the method of claim 1. **Altman et al.** teaches that the step of executing the algorithmic process is successively repeated to create different populations of improved antenna configurations, and wherein selected of the

improved antenna configurations comprise combinations of at least two of the basic antenna configurations (Page 1494, CL2, Para 3, L9-18).

17.4 As per claim 4, **Altman et al.** and **de Schweinitz et al.** teach the method of claim 1. **Altman et al.** teaches that the algorithm process includes calculating the voltage standing wave ratio for selected of the antenna configurations over a selected range of frequencies for antenna operation (Page 1494, CL1, Para 4, L4-8).

17.5 As per claim 5, **Altman et al.** and **de Schweinitz et al.** teach the method of claim 1. **Altman et al.** teaches that the selected antenna performance characteristics include at least one of input impedance, electric current through the antenna configuration, directivity, and reflection coefficient magnitude (Page 1494, CL1, Para 4, L4-8; Fig 2; Page 1495, CL2, Para 2, L5-9).

17.6 As per claim 6, **Altman et al.** and **de Schweinitz et al.** teach the method of claim 1. **Altman et al.** does not expressly teach a sleeve monopole antenna as produced by the optimum design specification method of claim 1. **de Schweinitz et al.** teaches a sleeve monopole antenna as produced by the optimum design specification method of claim 1 (CL3, L61-67), because that allows using the parasitic elements to form a lens which provides directionality of the antenna (Abstract, L14-16); and allows synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage (CL2, L35-38). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Altman et al.** with the method of **de Schweinitz et al.** that included a

sleeve monopole antenna as produced by the optimum design specification method of claim 1. The artisan would have been motivated because the parasitic elements would allow forming a lens which would provide directionality of the antenna; and allow synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage.

17.7 As per claim 8, **Altman et al.** and **de Schweinitz et al.** teach the method of claim 1. **Altman et al.** does not expressly teach a sleeve dipole antenna as produced by the optimum design specification method of claim 1. **de Schweinitz et al.** teaches a sleeve dipole antenna as produced by the optimum design specification method of claim 1 (CL3, L61-67), because that allows using the parasitic elements to form a lens which provides directionality of the antenna (Abstract, L14-16); and allows synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage (CL2, L35-38). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Altman et al.** with the method of **de Schweinitz et al.** that included a sleeve dipole antenna as produced by the optimum design specification method of claim 1. The artisan would have been motivated because the parasitic elements would allow forming a lens which would provide directionality of the antenna; and allow synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage.

18. Claims 9-13, 15-17 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Altman et al.** ("New designs of ultra wideband communication antennas using Genetic algorithm", IEEE 1997) in view of **de Schweinitz et al.** (U.S. Patent 6,317,092), and further in view of **Boag et al.** ("Design of electrically loaded wire antennas using Genetic algorithm", IEEE 1996).

18.1 As per claim 9, **Altman et al.** teaches a method for designing and producing an antenna structure characterized by omni-directional capabilities over a generally wide frequency range (Page 1494, CL1, Para 3, L1-3; Page 1494, CL2, Para 2, L1-4; Page 1494, CL2, Para 3, L1-6; Page 1494, CL1, Para 3, L5-10; Page 1495, CL2, Para 3, L1-5); comprising:

defining initial antenna parameters and providing a corresponding range of potential values for selected of the initial antenna parameters (Page 1494, CL2, Para 3, L3-6).

Altman et al. does not expressly teach a method for designing and producing a sleeve antenna structure characterized by omni-directional capabilities over a generally wide frequency range. **de Schweinitz et al.** teaches a method for designing and producing a sleeve antenna structure characterized by omni-directional capabilities over a generally wide frequency range (Fig. 1; Abstract, L1-3; CL1, L52-54; CL1, L15-17; CL2, L35-38; CL2, L56-67), because the sleeve antenna uses parasitic elements which form a lens which provides directionality of the antenna (Abstract, L14-16); and allows synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage (CL2, L35-38). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to

modify the method of **Altman et al.** with the method of **de Schweinitz et al.** that included a method for designing and producing a sleeve antenna structure characterized by omni-directional capabilities over a generally wide frequency range. The artisan would have been motivated because the sleeve antenna would use parasitic elements which would form a lens which would provide directionality of the antenna; and allow synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage.

Altman et al. teaches executing a first iteration of an algorithmic process to generate a population of individual antenna designs (Page 1494, CL2, Para 3, L9-15). **Altman et al.** does not expressly teach that selected individual antenna designs of the population of individual antenna designs are assigned a fitness value that characterizes selected performance measures of the individual antenna design. **Boag et al.** teaches that selected individual antenna designs of the population of individual antenna designs are assigned a fitness value (objective function) that characterizes selected performance measures of the individual antenna design (Page 688, CL2, Para 1, L13-21; Page 689, CL2, Para 4, L6-11), because the fitness value is primarily based on the antenna performance characteristics that the designer wishes to optimize (Page 688, CL2, Para 1, L13-14). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Altman et al.** with the method of **Boag et al.** that included the selected individual antenna designs of the population of individual antenna designs being assigned a fitness value that characterized selected performance measures of the individual antenna design. The artisan would have been motivated because the fitness value would be primarily based on the antenna performance characteristics that the designer wished to optimize.

Altman et al. does not expressly teach evaluating the population of individual antenna designs and selecting certain of the individual antenna designs as having an optimum fitness value. **Boag et al.** teaches evaluating the population of individual antenna designs and selecting certain of the individual antenna designs as having an optimum fitness value (Page 687, CL1, Para 1, L9-10; Page 688, CL2, Para 1, L3-6), because that allows various parameters of the antenna and the matching network to be optimized simultaneously (Page 687, CL1, Para 1, L4-6); and as per **Altman et al.** that allows finding a set of parameters that improves both the VSWR and the gain performance by decreasing the variation of input impedance with frequency and forcing the antenna to radiate along the desired direction near the horizon (Page 1494, Cl1, Para 4, L4-8). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Altman et al.** with the method of **Boag et al.** that included evaluating the population of individual antenna designs and selecting certain of the individual antenna designs as having an optimum fitness value. The artisan would have been motivated because that would allow various parameters of the antenna and the matching network to be optimized simultaneously; and would allow finding a set of parameters that would improve both the VSWR and the gain performance by decreasing the variation of input impedance with frequency and forcing the antenna to radiate along the desired direction near the horizon.

Altman et al. teaches executing at least a second iteration of the algorithmic process to generate an additional population of individual antenna designs (Page 1494, CL2, Para 3, L9-15). **Altman et al.** does not expressly teach executing at least a second iteration of the algorithmic process to generate an additional population of individual antenna designs with a corresponding fitness value assigned to selected individual antenna designs of the additional population. **Boag**

et al. teaches executing at least a second iteration of the algorithmic process to generate an additional population of individual antenna designs with a corresponding fitness value (objective function) assigned to selected individual antenna designs of the additional population (Page 688, CL2, Para 1, L13-21; Page 689, CL2, Para 4, L6-11), because the fitness value is primarily based on the antenna performance characteristics that the designer wishes to optimize (Page 688, CL2, Para 1, L13-14). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Altman et al.** with the method of **Boag et al.** that included executing at least a second iteration of the algorithmic process to generate an additional population of individual antenna designs with a corresponding fitness value assigned to selected individual antenna designs of the additional population. The artisan would have been motivated because the fitness value would be primarily based on the antenna performance characteristics that the designer wished to optimize.

18.2 As per claim 10, **Altman et al., de Schweinitz et al.** and **Boag et al.** teach the method of claim 9. **Altman et al.** teaches executing the algorithmic process to determine position of loads, the load values and the parameters of the matching network for combination with the basic antenna configuration to create improved antenna configurations (Page 1494, CL2, Para 3, L1-8). **Altman et al.** does not expressly teach the algorithmic process determines the size and location of parasitic elements for positioning around a basic antenna configuration, thereby generating improved antenna designs with greater bandwidth efficiency. **de Schweinitz et al.** teaches determining the size and location of parasitic elements for positioning around a basic antenna configuration, thereby generating improved antenna designs with greater bandwidth efficiency

(Fig. 1; Abstract, L1-3; CL1, L52-54; CL1, L57-59; CL2, L56-67; CL3, L61-67), because that allows using the parasitic elements to form a lens which provides directionality of the antenna (Abstract, L14-16); and allows synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage (CL2, L35-38). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to combine the algorithmic process to determine the parameters for the basic antenna configuration to create improved antenna configurations method of **Altman et al.** with the method of **de Schweinitz et al.** that included determining the size and location of parasitic elements for positioning around a basic antenna configuration, thereby generating improved antenna designs with greater bandwidth efficiency. The artisan would have been motivated because the parasitic elements would allow forming a lens which would provide directionality of the antenna; and allow synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage.

18.3 As per claim 11, **Altman et al., de Schweinitz et al.** and **Boag et al.** teach the method of claim 9. **Altman et al.** teaches that the algorithmic process includes calculating the electric current in selected of the individual antenna designs (Page 1494, CL1, Para 4, L4-8; Fig 2; Page 1495, CL2, Para 2, L5-9).

18.4 As per claim 12, **Altman et al., de Schweinitz et al.** and **Boag et al.** teach the method of claim 9. **Altman et al.** teaches that the selected performance measures include at least one of a voltage standing wave ratio, input impedance, directivity, and reflection coefficient magnitude of

selected of the individual antenna designs (Page 1494, CL1, Para 4, L4-8; Fig 2; Page 1495, CL2, Para 2, L5-9).

18.5 As per claim 13, **Altman et al., de Schweinitz et al.** and **Boag et al.** teach the method of claim 9. **Altman et al.** does not expressly teach a sleeve antenna as produced by the design method of claim 9, wherein the sleeve antenna comprises one of a sleeve monopole antenna and a sleeve dipole antenna. **de Schweinitz et al.** teaches a sleeve antenna as produced by the design method of claim 9, wherein the sleeve antenna comprises one of a sleeve monopole antenna and a sleeve dipole antenna (CL3, L61-67), because that allows using the parasitic elements to form a lens which provides directionality of the antenna (Abstract, L14-16); and allows synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage (CL2, L35-38). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Altman et al.** with the method of **de Schweinitz et al.** that included a sleeve antenna as produced by the design method of claim 9, wherein the sleeve antenna comprises one of a sleeve monopole antenna and a sleeve dipole antenna. The artisan would have been motivated because the parasitic elements would allow forming a lens which would provide directionality of the antenna; and allow synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage.

18.6 As per claim 15, **Altman et al.** teaches a process for enhancing basic antenna configurations to accommodate ideal operation in a wider frequency band (Page 1494, CL1, Para

3, L1-3; Page 1494, CL2, Para 2, L1-4; Page 1494, CL2, Para 3, L1-6; Page 1494, CL1, Para 3, L5-10; Page 1495, CL2, Para 3, L1-5); comprising the steps of:

providing a design algorithm for use in accordance with the process for enhancing basic antenna configurations as input to the design algorithm (Page 1494, CL2, Para 2, L1-7; Page 1494, CL2, Para 3, L1-8; Page 1497, CL1, Para 5, L6-10); and

providing general antenna parameters and a corresponding range of potential values for selected of the general antenna parameters (Page 1494, CL2, Para 3, L3-6).

Altman et al. does not expressly teach specifying the resolution of selected of the general antenna parameters. **Boag et al.** teaches specifying the resolution of selected of the general antenna parameters (Page 689, CL1, Para 1, L8-10), because the resolution specifies the accuracy to which the parameter can be tuned in practice (Page 689, CL1, Para 1, L8-1014). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the process of **Altman et al.** with the process of **Boag et al.** that included specifying the resolution of selected of the general antenna parameters. The artisan would have been motivated because the resolution would specify the accuracy to which the parameter could be tuned in practice.

Altman et al. teaches performing a first iteration of an algorithmic process to generate a population of individual antenna designs (Page 1494, CL2, Para 3, L9-15). **Altman et al.** does not expressly teach that each individual antenna of the population of individual antenna designs is assigned a fitness value that characterizes selected performance measures of the individual antenna design. **Boag et al.** teaches that each individual antenna of the population of individual

antenna designs is assigned a fitness value (objective function) that characterizes selected performance measures of the individual antenna design (Page 688, CL2, Para 1, L13-21; Page 689, CL2, Para 4, L6-11), because the fitness value is primarily based on the antenna performance characteristics that the designer wishes to optimize (Page 688, CL2, Para 1, L13-14). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the process of **Altman et al.** with the process of **Boag et al.** that included each individual antenna of the population of individual antenna designs being assigned a fitness value that characterized selected performance measures of the individual antenna design. The artisan would have been motivated because the fitness value would be primarily based on the antenna performance characteristics that the designer wished to optimize.

Altman et al. does not expressly teach that the selected of the individual antenna designs are characterized as having a sleeve configuration with a central antenna portion surrounded by a plurality of parasitic elements. **de Schweinitz et al.** teaches that the selected of the individual antenna designs are characterized as having a sleeve configuration with a central antenna portion surrounded by a plurality of parasitic elements (Fig. 1; Abstract, L1-3; CL1, L52-54; CL1, L15-17; CL2, L35-38; CL2, L56-67), because the sleeve antenna uses parasitic elements which form a lens which provides directionality of the antenna (Abstract, L14-16); and allows synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage (CL2, L35-38). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the process of **Altman et al.** with the process of **de Schweinitz et al.** that included the selected of the individual antenna designs being characterized as having a sleeve configuration with a central antenna portion surrounded by a

plurality of parasitic elements. The artisan would have been motivated because the sleeve antenna would use parasitic elements which would form a lens which would provide directionality of the antenna; and allow synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage.

Altman et al. does not expressly teach evaluating the fitness values of selected of the individual antenna designs to determine which of the antenna designs are characterized by optimum fitness values. **Boag et al.** teaches evaluating the fitness values of selected of the individual antenna designs to determine which of the antenna designs are characterized by optimum fitness values (Page 687, CL1, Para 1, L9-10; Page 688, CL2, Para 1, L3-6), because that allows various parameters of the antenna and the matching network to be optimized simultaneously (Page 687, CL1, Para 1, L4-6); and as per **Altman et al.** that allows finding a set of parameters that improves both the VSWR and the gain performance by decreasing the variation of input impedance with frequency and forcing the antenna to radiate along the desired direction near the horizon (Page 1494, Cl1, Para 4, L4-8). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the process of **Altman et al.** with the process of **Boag et al.** that included evaluating the fitness values of selected of the individual antenna designs to determine which of the antenna designs are characterized by optimum fitness values. The artisan would have been motivated because that would allow various parameters of the antenna and the matching network to be optimized simultaneously; and would allow finding a set of parameters that would improve both the VSWR and the gain performance by decreasing the variation of input impedance with frequency and forcing the antenna to radiate along the desired direction near the horizon.

Altman et al. teaches performing at least a second iteration of the algorithmic process to generate an additional population of individual antenna designs (Page 1494, CL2, Para 3, L9-15). **Altman et al.** does not expressly teach performing at least a second iteration of the design algorithm to generate an additional population of individual antenna designs, wherein selected of the individual antenna designs are identified as having a most optimum fitness value.. **Boag et al.** teaches performing at least a second iteration of the design algorithm to generate an additional population of individual antenna designs, wherein selected of the individual antenna designs are identified as having a most optimum fitness value (Page 687, CL1, Para 1, L9-10; Page 688, CL2, Para 1, L3-6), because that allows various parameters of the antenna and the matching network to be optimized simultaneously (Page 687, CL1, Para 1, L4-6); and as per **Altman et al.** that allows finding a set of parameters that improves both the VSWR and the gain performance by decreasing the variation of input impedance with frequency and forcing the antenna to radiate along the desired direction near the horizon (Page 1494, Cl1, Para 4, L4-8). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the process of **Altman et al.** with the process of **Boag et al.** that included performing at least a second iteration of the design algorithm to generate an additional population of individual antenna designs, wherein selected of the individual antenna designs are identified as having a most optimum fitness value. The artisan would have been motivated because that would allow various parameters of the antenna and the matching network to be optimized simultaneously; and would allow finding a set of parameters that would improve both the VSWR and the gain performance by decreasing the variation of input impedance with frequency and forcing the antenna to radiate along the desired direction near the horizon.

18.7 As per claim 16, **Altman et al., de Schweinitz et al.** and **Boag et al.** teach the process of claim 15. **Altman et al.** teaches that the general antenna parameters include at least one of frequency range of operation, range of antenna height, and dimensions of wires or of other elements for potential construction of the antenna configurations (Page 1494, CL2, Para 2, L1-7; Fig 2; Page 1494, CL2, Para 3, L3-6).

18.8 As per claim 17, **Altman et al., de Schweinitz et al.** and **Boag et al.** teach the process of claim 15. **Altman et al.** does not expressly teach that the resolution of selected general antenna parameters is specified as a number of bits per parameter. **Boag et al.** teaches that the resolution of selected general antenna parameters is specified as a number of bits per parameter (Page 689, CL1, Para 1, L8-10), because the resolution specifies the accuracy to which the parameter can be tuned in practice (Page 689, CL1, Para 1, L8-1014). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the process of **Altman et al.** with the process of **Boag et al.** that included the resolution of selected general antenna parameters being specified as a number of bits per parameter. The artisan would have been motivated because the resolution would specify the accuracy to which the parameter could be tuned in practice.

18.9 As per claim 19, **Altman et al., de Schweinitz et al.** and **Boag et al.** teach the process of claim 15. **Altman et al.** teaches that the design algorithm comprises antenna design software for use in conjunction with a computer system (Page 1494, CL2, Para 3, L6-18).

18.10 As per claim 20, **Altman et al., de Schweinitz et al.** and **Boag et al.** teach the process of claim 15. **Altman et al.** does not expressly teach a sleeve antenna configuration as constructed from the process of claim 15, wherein the sleeve antenna comprises one of a sleeve monopole antenna and a sleeve dipole antenna. **de Schweinitz et al.** teaches a sleeve antenna configuration as constructed from the process of claim 15, wherein the sleeve antenna comprises one of a sleeve monopole antenna and a sleeve dipole antenna (CL3, L61-67), because that allows using the parasitic elements to form a lens which provides directionality of the antenna (Abstract, L14-16); and allows synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage (CL2, L35-38). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the process of **Altman et al.** with the process of **de Schweinitz et al.** that included a sleeve antenna configuration as constructed from the process of claim 15, wherein the sleeve antenna comprised one of a sleeve monopole antenna and a sleeve dipole antenna. The artisan would have been motivated because the parasitic elements would allow forming a lens which would provide directionality of the antenna; and allow synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage.

19. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Altman et al.** ("New designs of ultra wideband communication antennas using Genetic algorithm", IEEE 1997) in view of **de Schweinitz et al.** (U.S. Patent 6,317,092), and further in view of **Boag et al.**

("Design of electrically loaded wire antennas using Genetic algorithm", IEEE 1996) and **Odachi et al.** (U.S. Patent 6,346,916).

19.1 As per claim 21, **Altman et al., de Schweinitz et al.** and **Boag et al.** teach the process of claim 15. **Altman et al.** does not expressly teach a helical sleeve antenna configuration as constructed from the process of claim 15. **de Schweinitz et al.** teaches a sleeve antenna configuration as constructed from the process of claim 15 (CL3, L61-67), because that allows using the parasitic elements to form a lens which provides directionality of the antenna (Abstract, L14-16); and allows synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage (CL2, L35-38). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the process of **Altman et al.** with the process of **de Schweinitz et al.** that included a sleeve antenna configuration as constructed from the process of claim 15. The artisan would have been motivated because the parasitic elements would allow forming a lens which would provide directionality of the antenna; and allow synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage.

Altman et al. does not expressly teach a helical sleeve antenna configuration as constructed from the process of claim 15. **Odachi et al.** teaches helical antenna configuration (CL3, L66-to CL4, L1), because the helical antenna makes the antenna small in size (CL3, L67 to CL4, L1); and as per **de Schweinitz et al.** that allows using the parasitic elements with the helical antenna to form a lens which provides directionality of the antenna (Abstract, L14-16); and allows synthesis of an electrically scannable directional antenna with a higher useful gain

and a scanning ability of 360 degrees of coverage (CL2, L35-38). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to combine the process of **Altman et al.** with the process of **de Schweinitz et al.** and **Odachi et al.** that included helical antenna configuration. The artisan would have been motivated because the helical antenna would make the antenna small in size and the parasitic elements would allow forming a lens which would provide directionality of the antenna; and allow synthesis of an electrically scannable directional antenna with a higher useful gain and a scanning ability of 360 degrees of coverage.

Conclusion

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 571-272-3717. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska, can be reached on 571-272-3716. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-9600.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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Art Unit 2123
December 1, 2004

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